

Amendments to the Drawings

Attached is a replacement drawing sheet for amended Figure 16.

REMARKS

The abstract and specification have been amended in order to correct grammatical and idiomatic errors contained therein. No new matter has been added.

In order to respond to the Examiner's objection to and rejection of Claims 1-9 under 35 USC 112, Claims 1-9 have been canceled and replaced by newly presented Claims 10-23 which more particularly point out and distinctly claim the subject matter which Applicants regard as the invention. No new matter has been added. Support for newly presented independent Claims 10 and 17 is provided by Figures 1, 8, 9 and 15 and the descriptions thereof in the specification. No new matter has been added. It is respectfully submitted that the currently presented claims are cured of all formal defects and are patentably distinguishable over the prior art cited by the Examiner.

Claims 1-9 have been rejected under 35 USC 102(e) as being anticipated by Kang et al. Applicants respectfully traverse this ground of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a two-shaft hinge which enables rotational and opening/closing movements. The hinge comprises an opening/closing shaft having a through hole extending therethrough in a direction perpendicular to the axis of the opening/closing shaft and dividing the opening/closing shaft into a first segment and a second segment, a rotary shaft inserted through the through hole such that one end of the rotary shaft is provided at one side of the opening/closing shaft and an opposite end of the rotary shaft is provided at an opposite side of the opening/closing shaft, a torque unit for independently generating a sliding frictional torque on the rotational and opening/closing movements on each of the rotary shaft and the opening/closing shaft and comprising a first fixed cam, a first rotary cam and a first spring provided on the one end of

the rotary shaft, the first fixed cam and the first rotary cam being brought into abutting relationship with each other by the resilient force of the first spring and a second fixed cam, a second rotary cam and a second spring provided on the first segment of the opening/closing shaft, the second fixed cam and second rotary cam being brought into abutting relationship with each other by the resilient force of the second spring, and a rotation limiting mechanism for limiting the rotational movement of the rotary shaft along the opening/closing angle range of the opening/closing shaft, the rotation limiting mechanism comprising a first oval-shaped rotation limiting plate provided on the rotary shaft and formed to have a circular long diameter section and a linear short diameter section and a second cylindrical rotation limiting plate formed to have at least one projection and at least one grooved section provided on the periphery thereof provided on the opening/closing shaft and biased by the second spring, wherein by abutting the long diameter section of the first rotation limiting plate with the at least one grooved section of the second rotation limiting plate, the rotary shaft is allowed to rotate, by abutting the short diameter section of the first rotation limiting plate with the at least one projection of the second rotation limiting plate, the rotational movement of the rotary shaft is prevented and the first rotation limiting plate is contacted by the second rotation limiting plate at two sides thereof. In a second embodiment of the present invention, the first rotation limiting plate is contacted by the second rotation limiting plate at one side thereof.

As discussed in the present specification, the present invention provides a two-shaft hinge component in which durability and a reduction in size and weight can be achieved in portable telephones or notebook type personal computers. As shown in Figure 16, conventional prior art two-shaft hinges require a plate spring formed in corrugated fashion and brackets fixed to a shaft at both ends of a press-formed

opening/closing shaft by means of a fixing flange. A rotary shaft is arranged penetrating the middle of the opening/closing shaft and rotary frictional torque is generated through pressure contact with the plate spring. With this type of prior art hinge, since no rotary angle stop mechanism of the opening/closing shaft to limit the rotation of the rotary shaft was provided and due to the method of generating torque by pressing the friction plate into contact using the spring force of the dish spring, there were problems of looseness, rattling or poor durability due to the wear of the frictional plates or deformation of the plate spring. Torque fluctuation or deterioration of durability produced by secular change not only impair the quality of the device but also may cause failure. The presently claimed invention has been arrived at in order to overcome these problems.

The Kang et al reference discloses a hinge system for a portable wireless terminal. The hinge module comprises a hinge housing having a holing pin hole formed through one end thereof and a hinge shaft hole formed through the other end thereof in a direction of the first rotation axis. The hinge housing has a fixing seat and an opening, with the fixing seat being formed at a portion of an inner surface thereof in the direction of the second rotation axis and the opening being formed through an opposed portion to the fixing seat. The fixing seat is exposed through the opening in the direction of the second rotation axis and a supporting shaft is fixed to the fixing seat of the hinged housing and extends through the opening of the hinge housing. A hinge cam is fixed to the supporting shaft and has a valley-shaped portion formed at one side thereof with the valley-shaped portion having a curved surface. A hinge shaft having a mountain-shaped portion is formed at one side thereof and a hinge shaft hole is formed through both sides thereof. The mountain-shaped portion has a curved surface and the supporting shaft is inserted through the hinge shaft hole so that the hinge shaft is fitted around the supporting shaft in such a manner that the curved surface

of the mountain-shaped portion is opposed to the curved surface of the valley-shaped portion. The hinge shaft has at least one guide protuberance formed on a circumferential surface of the hinge shaft and an elastic means forces the hinge shaft towards the hinge cam so that the curved surfaces of the mountain-shaped portion and the valley-shaped portion are in sliding contact with each other. A rotary shaft having a shape of a cylinder has an open end and a closed end opposite to each other with the rotary shaft containing the hinge cam, the hinge shaft and the elastic means. The elastic means is supported by the closed end of the rotary shaft and the rotary shaft has a guide hole with which the guide protuberance of the hinge shaft is engaged and the rotary shaft has an assembly means to which one end of the folder is fixed. However, this reference does not disclose a two-shaft hinge according to the present invention.


In the present invention, a rotation limiting mechanism comprising a first rotation limiting plate on the rotary shaft and a second rotation limiting plate on the opening/closing shaft which abut each other directly and the second plate limiting the rotation of the rotary shaft depending on the opening/closing angle range of the opening/closing shaft is not shown in Kang et al. In Kang et al, as shown in Figure 3 of this reference, the housing 110 for the supporting shaft 130, which corresponds to the rotary shaft of the present invention, is rotatable with respect to the terminal body 210 about axis A1, which corresponds to the direction of the opening/closing shaft of the present invention as discussed in column 10, lines 37-47 of this reference. As illustrated in Figures 6 and 14 of Kang et al, the end of hinge shaft 330, which corresponds to the opening/closing shaft, does not engage with the supporting shaft or the housing of the supporting shaft. Therefore, the hinge shaft cannot limit the rotation of the support shaft. Moreover, the hinge shaft cannot restrict the rotation of the support shaft depending on the rotational angle range of the hinge shaft itself.

Therefore, the presently claimed invention clearly is distinguishable over this reference.

Although the Examiner mentions a sliding groove 117 in Figure 3 of Kang et al as a rotation limiting mechanism equivalent to that of the present invention, although the rotary shaft can rotate along the sliding groove 117, which was formed within the range of 180°, the hinge shaft does not work on the housing having the groove 117 to limit the rotational movement of the rotary shaft. Therefore, it is respectfully submitted that the presently claimed invention clearly is patentably distinguishable over the prior art cited by the Examiner. Also enclosed herewith for the Examiner's approval is a replacement Figure 16 which is indicated as being "prior art".

Reconsideration of the present application and the passing of it to issue is respectfully solicited.

Respectfully submitted,


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Encl: Replacement Drawing Sheet for Figure 16
Replacement Abstract
Clean Substitute Specification
Marked-Up Substitute Specification
Postal Card

136.07/05